Product Description

Tobii X2-30 Eye Tracker Compact Edition
Tobii X2-30 Eye Tracker Wide Edition
Tobii X2-60 Eye Tracker Compact Edition
Tobii X2-60 Eye Tracker Wide Edition

Product Description

Manual Version 1.0
01/2013
All rights reserved.
© Tobii Technology AB

The information contained in this document is proprietary to Tobii Technology. Any reproduction in part or whole without prior written authorization by Tobii Technology is prohibited.

Products that are referred to in this document may be either trademarks and/or registered trademarks of the respective owners. The publisher and the author make no claim to these trademarks.

While every precaution has been taken in the preparation of this document, the publisher and the author assume no responsibility for errors or omissions, or for damages resulting from the use of information contained in this document or from the use of programs and source code that may accompany it. In no event shall the publisher and the author be liable for any loss of profit or any other commercial damage caused or alleged to have been caused directly or indirectly by this document.

Content subject to change without notice.

Please check Tobii web site www.tobii.com for updated versions of this manual.

Table of Contents

1 Introduction 1
1.1 Overview 1
1.2 Applications Areas 2
1.3 Basic Operating Principles 2
2 Technical Specifications 3
2.1 Tobii X2–30 Eye Trackers 3
2.2 Tobii X2–60 Eye Trackers 5
3 Data Sample Output 8
4 Eye Tracking Setups 9
4.1 Typical Tobii X2 Eye Tracker Screen Setups 9
4.1.1 Local Live Viewer 9
4.2 Typical Tobii X2 Eye Tracker Physical Object Setup 10
4.2.1 External video stimulus recording 10
Appendix A:Glossary 11
Appendix B:Accuracy and Precision Measurements 12
B:1 Gaze Precision 12
B:2 Gaze Accuracy 12
Appendix C:Compliance Information and Warnings 13
C:1 FCC Statement 13
C:2 Industry Canada Statement 13
C:3 Standards 13
C:4 Mounting Warning 13
C:5 Infrared Warning 14

1 Introduction

1.1 Overview

This document describes the features and functionality of the Tobii X2 Eye Trackers. The X2 Eye Tracker is a stand alone eye tracker that can be used in various setups by attaching it to monitors, laptops or for performing eye tracking on physical objects. The eye tracker requires some assembly before first time use and after transport.

The Tobii X2 Eye Tracker is an unobtrusive eye tracker for detailed research of natural behavior. Its large head movement box allows the subject to move during recording while maintaining accuracy and precision. The Tobii X2 Eye Trackers offer maximum flexibility with numerous software and stimuli set-up options.

The X2-30 and X2–60 Eye Trackers come in a Compact and in a Wide Edition, to meet you're your specific needs:

- The **Compact Edition** is a smaller version of the eye tracker, measuring 184 mm (7.2'') in length. It enables your portable eye tracking lab or studies that require a small eye tracker to track:
  - Laptops and smaller PC monitors up to app. 22'' (up to 31° gaze angle)
  - Mobile devices
  - Small real-world interfaces

  Tobii X2-30 Eye Tracker Compact Edition mounted on a laptop (laptop not included):

- The **Wide Edition**, measuring 400 mm (15.7'') in length, is designed for studies that require larger gaze angels (up to 37°). It enables studies that involve larger stimuli, being able to track interfaces such as:
  - PC monitors up to app. 27''
  - TV screens
  - Projections, simulators
  - Large real-world interfaces

  Tobii X2-30 Eye Tracker Wide Edition mounted on a monitor (monitor not included):

1.2 Applications Areas

The modular system can be used both in screen and real-world test scenarios, making way for a very broad spectrum of studies. You can mount the eye tracker on a laptop, a PC monitor, an all-in-one PC, or even a tablet. Present your stimuli using a projection or TV. You can study real-world interfaces like a control panel, an ATM or a store shelf. The supplied mounting solutions support a variety of study designs.

- **Tobii X2–30 Eye Trackers** — The X2-30 Eye Trackers are designed for studies primarily aimed at determining precisely where the participants are looking — the gaze point—rather than studying timing, duration of fixations or eye movements such as saccades, for example.
- **Tobii X2–60 Eye Trackers** — The X2-60 eye tracker is designed for studies aimed at determining precisely where the participants are looking and for studying and measuring eye fixations and other eye tracking metrics based on these.

1.3 Basic Operating Principles

During tracking, Tobii Eye Trackers use infrared diodes to generate reflection patterns on the corneas of the subject's eyes. These reflection patterns, together with other visual data about the subject, are collected by image sensors. Sophisticated image processing algorithms identify relevant features, including the eyes and the corneal reflection patterns. Complex mathematics is used to calculate the 3D position of each eyeball, and finally the gaze point on the screen; in other words, where the subject is looking.

Tobii Eye Trackers are designed for use in indoor office environments.

2 Technical Specifications

The characteristics of an eye tracker can be described in terms of gaze accuracy and gaze precision. Accuracy describes the angular average distance from the actual gaze point to the one measured by the eye tracker. Gaze precision describes the spatial variation between successive samples collected when the subject fixates at a specific point on a stimuli. More information regarding the accuracy and precision measurements can be found in *Appendix B: Accuracy and Precision Measurements*. A glossary can be found at *Appendix A: Glossary*.

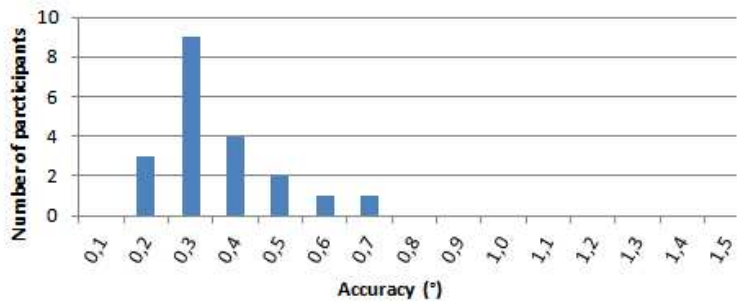
2.1 Tobii X2–30 Eye Trackers

Table 2.1 Gaze Accuracy (Preliminary)

Gaze accuracy[1]	Tobii X2-30 Eye Tracker Compact Edition (firmware version 0.7.3)		Tobii X2-30 Eye Tracker Wide Edition (firmware version — pending)	
	Binocular	**Monocular**	**Binocular**	**Monocular**
At ideal conditions	0.4	0.5	0.4	0.5
At 25° gaze angle	0.5	0.6	0.5	0.6
At 30° gaze angle	0.5	0.6	0.5	0.6
At 35° gaze angle	N/A	N/A	Pending	Pending
At 1 lux	Pending	Pending	Pending	Pending
At 300 lux	0.4	0.5	0.4	0.5
At 600 lux	Pending	Pending	Pending	Pending
At 1000 lux	Pending	Pending	Pending	Pending
White stimuli background	Pending	Pending	Pending	Pending

1. Accuracy under ideal conditions is measured in the centre of the head movement box with the subject fixed in a chinrest. Data is collected immediately after calibration, in a controlled laboratory environment with constant illumination, with 9 stimuli points at gaze angles of ≤18°.

Accuracy at ideal conditions — X2–30 Compact Edition (Preliminary)



Accuracy at varying distances — X2–30 Compact Edition (Preliminary)

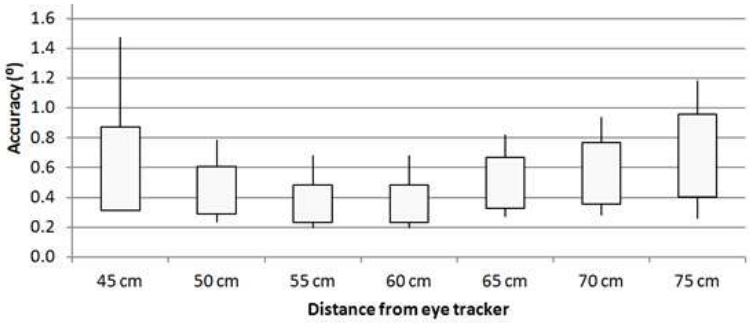


Table 2.2 Gaze Precision (Preliminary)

Gaze precision		Tobii X2-30 Eye Tracker Compact Edition		Tobii X2-30 Eye Tracker Wide Edition	
		Binocular	**Monocular**	**Binocular**	**Monocular**
Artificial Eye	With Stampe filter 2[1]	Pending	Pending	Pending	Pending
	Without filter	Pending	Pending	Pending	Pending
Human Eye	With Stampe filter 2	Pending	Pending	Pending	Pending
	Without filter	0.32	0.43	0.32	0.43

1. Stampe (Behavior Research Methods, Instruments & Computers, 1993, 25 (2), pp.137-142) describes a noise reduction filter commonly used for eye tracking data. In these measurements, the Stampe stage 2 algorithm has been applied.

Table 2.3 Eye Tracking Specifications (Preliminary)

		Tobii X2-30 Eye Tracker Compact Edition	Tobii X2-30 Eye Tracker Wide Edition
Sampling rate[1]		30 Hz (std. deviation ~ 3Hz)	30 Hz (std. deviation ~ 3Hz)
Total system latency		48–67 ms	48-67 ms
Time to tracking recovery		For blinks: immediate	For blinks: immediate
Head movement[2]	Freedom of head movement at 70 cm (width x height)	50 x 36 cm (20 x 14″)	50 x 36 cm (20 x 14″)
	Operating distance (eye tracker to subject)	40–90 cm (15.7–33.5″)	50–100 cm (20–39″)
Recommended screen size		up to 22″	up to 27″
Data sample output		Timestamp, eye position, gaze point, pupil diameter, validity code	Timestamp, eye position, gaze point, pupil diameter, validity code

1. As the Tobii X2-30 Eye Trackers have a variable and low sampling rate, they are not suitable for detailed studies of the onset or durations of fixations, saccades or other measures requiring high temporal and stable sampling precision.
2. Freedom of head movement describes the volume in front of the tracker in which the user must have at least one of the eyes. The numbers are specified parallel/orthogonal to screen surface, assuming eye tracker is at 20 degree angle to screen.

Table 2.4 Eye Tracking Units (Preliminary)

	Tobii X2-30 Eye Tracker Compact Edition	Tobii X2-30 Eye Tracker Wide Edition
Eye tracker processing unit	Embedded, no external eye tracking host necessary	Embedded, no external eye tracking host necessary
Connectors	USB 2.0	USB 2.0
Weight	200 g (7.1 oz)	250 g (8.8 oz)
Size	184*28*23 mm (7.2 * 1.1* 0.9″)	400*28*23 mm (15.7 * 1.1* 0.9″)
Mounting solutions	Adhesive Mounting brackets for monitors, laptops and tablets. Desk Stand Accessory package for Tripod and desks	Adhesive Mounting brackets for monitors, laptops and tablets. Desk Stand Accessory package for Tripod and desks

Table 2.5 Hardware package content (Preliminary)

Tobii X2-30 Eye Tracker Compact Edition Hardware Package	**Tobii X2-30 Eye Tracker Wide Edition Hardware Package**
Tobii X2-30 Eye Tracker Compact Edition	Tobii X2-30 Eye Tracker Wide Edition
3 x Adhesive mounting bracket kit (each kit contains 3 brackets for different screen depths) for permanent installation.	6 x Adhesive mounting bracket kit (each kit contains 3 brackets for different screen depths) for permanent installation.
Safety Instructions	Safety Instructions
Installation Guide	Installation Guide
Mounting tape kit	Mounting tape kit
USB extension cable	N/A
Zipper bag	Zipper bag
Tobii X2-30 Eye Tracker USB memory stick containing the Tobii Eye Tracker Installer.	Tobii X2-30 Eye Tracker USB memory stick containing the Tobii Eye Tracker Installer.
Tobii X2-30 Eye Tracker user manual	Tobii X2-30 Eye Tracker user manual
N/A	X2 Wide Edition mounting aid

Table 2.6 Accessories (Preliminary)

Tobii X2-30 Eye Tracker Compact Edition	**Tobii X2-30 Eye Tracker Wide Edition**
Tobii X2 Eye Tracker laptop case	Tobii X2 Eye Tracker laptop case
Tobii X2 Eye Tracker desk stand package: • Tobii X2 Eye Tracker desk stand kit • Digital angle gauge • Measuring tape	Tobii X2 Eye Tracker desk stand package: • Tobii X2 Eye Tracker desk stand kit • Digital angle gauge • Measuring tape

2.2 Tobii X2–60 Eye Trackers

Table 2.1 Gaze Accuracy (Preliminary)

Gaze accuracy[1]	**Tobii X2-60 Eye Tracker Compact Edition (firmware version — pending)**		**Tobii X2-60 Eye Tracker Wide Edition (firmware version — pending)**	
	Binocular	**Monocular**	**Binocular**	**Monocular**
At ideal conditions	0.4	0.5	0.4	0.5
At 25° gaze angle	0.5	0.6	0.5	0.6
At 30° gaze angle	0.5	0.6	0.5	0.6
At 35° gaze angle	N/A	N/A	Pending	Pending
At 1 lux	Pending	Pending	Pending	Pending
At 300 lux	0.4	0.5	0.4	0.5
At 600 lux	Pending	Pending	Pending	Pending
At 1000 lux	Pending	Pending	Pending	Pending
White stimuli background	Pending	Pending	Pending	Pending

1. Accuracy under ideal conditions is measured in the centre of the head movement box with the subject fixed in a chinrest. Data is collected immediately after calibration, in a controlled laboratory environment with constant illumination, with 9 stimuli points at gaze angles of ≤18°.

Table 2.2 Gaze Precision (Preliminary)

Gaze precision		Tobii X2-60 Eye Tracker Compact Edition		Tobii X2-60 Eye Tracker Wide Edition	
		Binocular	**Monocular**	**Binocular**	**Monocular**
Artificial Eye	With Stampe filter 2[1]	Pending	Pending	Pending	Pending
	Without filter	Pending	Pending	Pending	Pending
Human Eye	With Stampe filter 2	Pending	Pending	Pending	Pending
	Without filter	0.32	0.43	0.32	0.43

1. Stampe (Behavior Research Methods, Instruments & Computers, 1993, 25 (2), pp.137-142) describes a noise reduction filter commonly used for eye tracking data. In these measurements, the Stampe stage 2 algorithm has been applied.

Table 2.3 Eye Tracking Specifications (Preliminary)

		Tobii X2-60 Eye Tracker Compact Edition	Tobii X2-60 Eye Tracker Wide Edition
Sampling rate		60 Hz (std. deviation approx. 0.1Hz)	60 Hz (std. deviation approx. 0.1Hz)
Total system latency		48–67 ms	48-67 ms
Time to tracking recovery		For blinks: immediate	For blinks: immediate
Head movement[1]	Freedom of head movement at 70 cm (width x height)	50 x 36 cm (20 x 14″)	50 x 36 cm (20 x 14″)
	Operating distance (eye tracker to subject)	45–90 cm (15.7–33.5″)	50–100 cm (20–39″)
Recommended screen size		up to 22″	up to 27″
Data sample output		Timestamp, eye position, gaze point, pupil diameter, validity code	Timestamp, eye position, gaze point, pupil diameter, validity code

1. Freedom of head movement describes the volume in front of the tracker in which the user must have at least one of the eyes. The numbers are specified parallel/orthogonal to screen surface, assuming eye tracker is at 20 degree angle to screen.

Table 2.4 Eye Tracking Units (Preliminary)

	Tobii X2-60 Eye Tracker Compact Edition	Tobii X2-60 Eye Tracker Wide Edition
Eye tracker processing unit	Tobii X2-60 Eye Tracker external processing unit	Tobii X2-60 Eye Tracker external processing unit
Connectors	USB 2.0	USB 2.0
Weight	200 g (7.1 oz)	250 g (8.8 oz)
Size	184 x 28 x 23 mm (7.2 x 1.1 x 0.9″)	400 x 28 x 23 mm (15.7 x 1.1 x 0.9″)
Mounting solutions	Adhesive Mounting brackets for monitors, laptops and tablets. Desk Stand Accessory package for Tripod and desks	Adhesive Mounting brackets for monitors, laptops and tablets. Desk Stand Accessory package for Tripod and desks

Table 2.5 Tobii X2-60 Eye Tracker external processing unit

Connectors	USB 2.0, LAN and power connector
Size	116.6 x 112 x 39 mm (4.6 x 4.4 x 1.55″)
Weight	500 g (17.6 oz)

Table 2.6 Hardware package content (Preliminary)

Tobii X2-60 Eye Tracker Compact Edition Hardware Package	**Tobii X2-60 Eye Tracker Wide Edition Hardware Package**
Tobii X2-60 Eye Tracker Compact Edition	Tobii X2-60 Eye Tracker Wide Edition
3 x Adhesive mounting bracket kit (each kit contains 3 brackets for different screen depths) for permanent installation.	6 x Adhesive mounting bracket kit (each kit contains 3 brackets for different screen depths) for permanent installation.
Safety Instructions	Safety Instructions
Installation Guide	Installation Guide
Mounting tape kit	Mounting tape kit
USB extension cable	N/A
Zipper bag	Zipper bag
Tobii X2-60 Eye Tracker USB memory stick containing the Tobii Eye Tracker Installer.	Tobii X2-60 Eye Tracker USB memory stick containing the Tobii Eye Tracker Installer.
Tobii X2-60 Eye Tracker user manual	Tobii X2-60 Eye Tracker user manual
Tobii X2-60 Eye Tracker external processing unit	Tobii X2-60 Eye Tracker external processing unit
N/A	X2 Wide Edition mounting aid

Table 2.7 Accessories (Preliminary)

Tobii X2-60 Eye Tracker Compact Edition	**Tobii X2-60 Eye Tracker Wide Edition**
Tobii X2 Eye Tracker laptop case	Tobii X2 Eye Tracker laptop case
Tobii X2 Eye Tracker desk stand package: • Tobii X2 Eye Tracker desk stand kit • Digital angle gauge • Measuring tape	Tobii X2 Eye Tracker desk stand package: • Tobii X2 Eye Tracker desk stand kit • Digital angle gauge • Measuring tape

3 Data Sample Output

Different applications can be connected as clients to the eye tracker to, e.g., gather eye gaze data in real-time and perform calibrations. Applications that can be used together with the eye tracker include the Tobii Studio™ analysis software, third party analysis products such as E-Prime® or your own custom written software for analysis, gaze-contingent applications or eye control applications. For more information on how to create your own applications, please refer to the Tobii Software Development Kit (SDK) product description, version 3.0 or later.

Below is a list of data that can be accessed through the output of the eye tracker. In Tobii Studio™ analysis software this data can be accessed through a Data export function, and easily imported into a spreadsheet for further analysis. Please note that some of the parameter names differs between what is delivered from the SDK and what is available in the Tobii Studio™ data export.

Timestamp	Timestamp in milliseconds stating the mid-exposure time when the sample was collected by the eye tracker's image sensors.
GazePointXLeft	Horizontal screen position of the gaze point for the left eye.
GazePointYLeft	Vertical screen position of the gaze point for the left eye.
CamXLeft	Horizontal location of the left pupil in the camera image (0 is left edge, 1 is right edge).
CamYLeft	Vertical location of the left pupil in the camera image (0 is top, 1 is bottom).
DistanceLeft	Distance from the eye tracker to the left eye. The distance is given in mm on a straight axis right out from the eye tracker plane.
PupilLeft	Size of the pupil (left eye) in mm. The distance and pupil size measurements are calculated to be as close to real values as possible. However, individual differences in the eyes of subjects or the strength of glasses/contact lenses will affect the size values. Shifts between the use of eye tracking technique during a recording will also affect the pupil size value.
ValidityLeft	The validity code indicates the system's confidence in whether it has correctly identified which eye is left and right for the specific sample. The validity is 0 if the eye is found and the tracking quality good. If the eye cannot be found by the eye tracker the validity code will be 4. The value is for the left eye.
GazePointXRight	The horizontal screen position of the gaze point for the right eye.
GazePointYRight	Vertical screen position of the gaze point for the right eye .
CamXRight	Horizontal location of the right pupil in the camera image (0 is left edge, 1 is right edge).
CamYRight	Vertical location of the right pupil in the camera image (0 is top, 1 is bottom).
DistanceRight	Distance from the eye tracker to the right eye. The distance is given in mm on a straight axis out from the eye tracker plane.
PupilRight	Size of the pupil (right eye) in mm. The distance and pupil size measures are calculated to be as close to real values as possible. However, individual differences in the eyes of subjects or the strength of glasses/contact lenses will affect these values. Shifts between the use of eye tracking technique during a recording will also affect the pupil size value.
ValidityRight	The validity code indicates the system's confidence in whether it has correctly identified which eye is left and right for the specific sample. The validity is 0 if the eye is found and tracking quality is good. If the eye cannot be found by the eye tracker, the validity code will be 4. The value is for the right eye.

4 Eye Tracking Setups

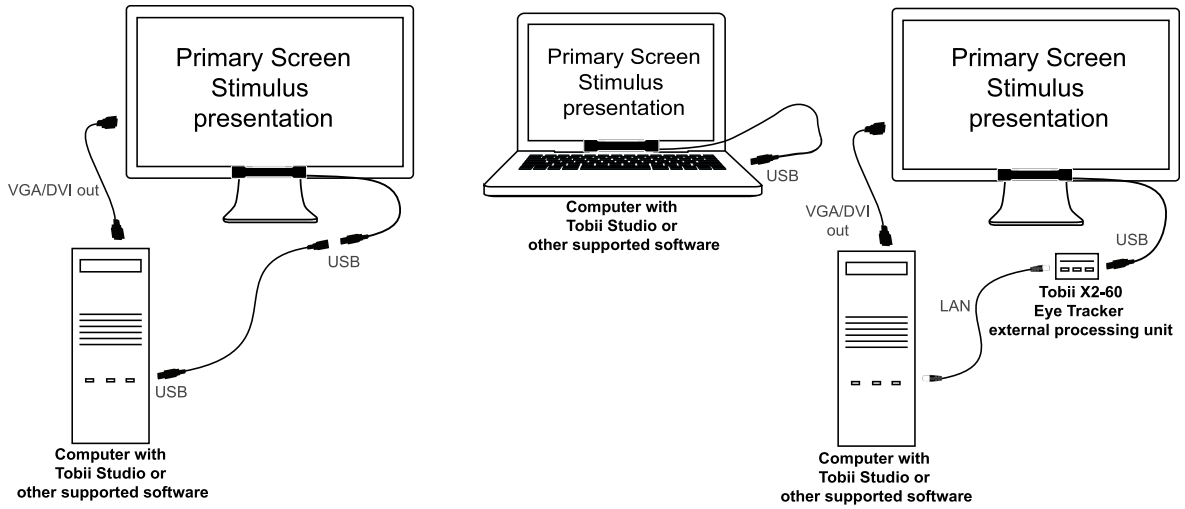
This chapter describes typical setup configurations that can be used with the Tobii X2 Eye Trackers. For specific information about custom configurations or system requirements and recommendation, please contact your Tobii sales representative or Tobii technical support. The System Requirements and Recommendations document can be downloaded at www.tobii.com.

Your particular needs might differ from these typical configurations. More detailed information is available in the Eye Tracker User Manual provided with the product.

4.1 Typical Tobii X2 Eye Tracker Screen Setups

These basic setups are the simplest setups when using on screen stimuli, such as images, movies or web. To record the participant's reactions, the conversation between the test leader and test participant, you need to connect an external user camera and microphone to the computer running Tobii Studio. The setups below do not include the user camera and user sound.

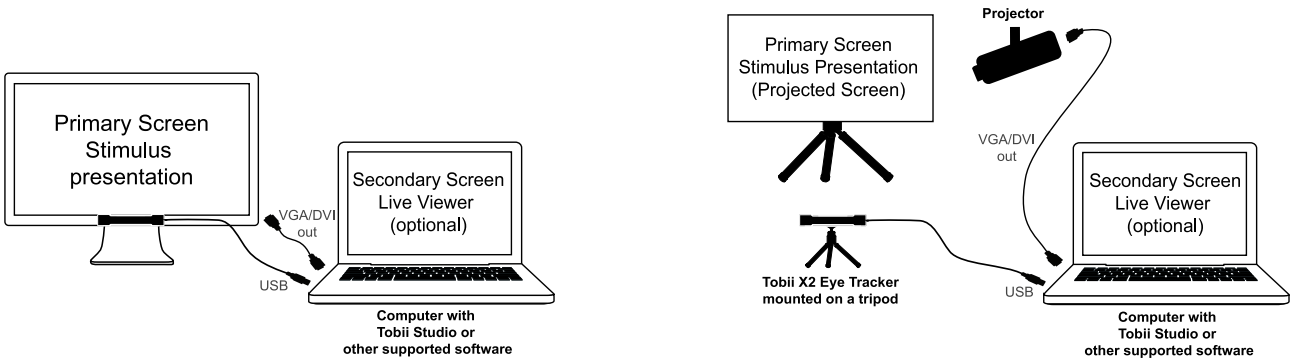
Single Screen Setups



4.1.1 Local Live Viewer

The setup below is used when the test is to be supervised from a separate screen where the test leader can see the eye movements of the subject in real time during testing.

Local Live Viewer Setups

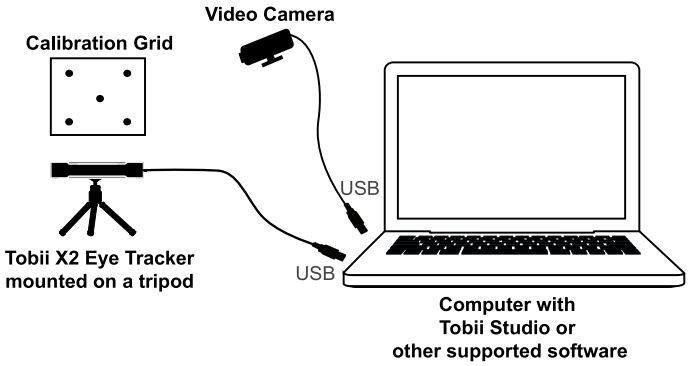


4.2 Typical Tobii X2 Eye Tracker Physical Object Setup

When studying a stimuli that doesn't have a screen or when studying an external device such as a mobile phone, a physical object setup needs to be used where a video or web camera captures the image of the stimuli.

To record the participant's reactions, the conversation between the test leader and test participant, you need to connect an additional camera and microphone to the computer running Tobii Studio. The setups below do not include the user camera and user sound.

Physical Object Setup



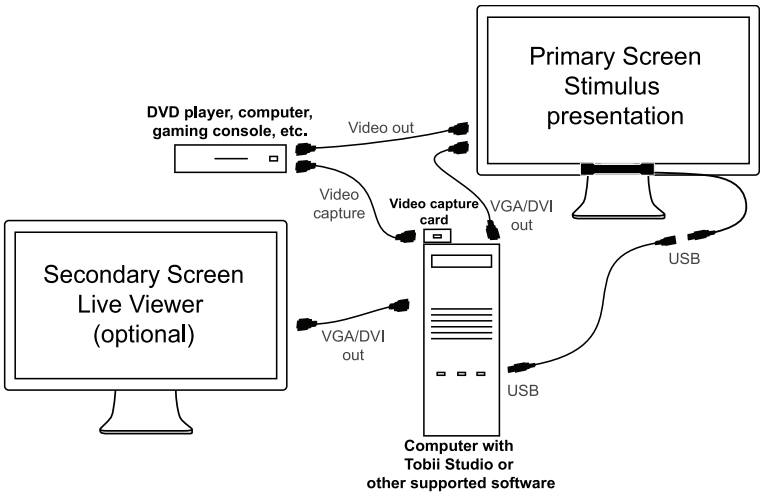
4.2.1 External video stimulus recording

This setup is suitable when using a Tobii Eye Tracking system for eye tracking data analysis when the stimulus is presented from a separate computer or other RGB or VGA sources. This could include a computer game, a DVD player, or when stimulus is presented on a computer running a different operating system. The computer running Tobii Studio must be equipped with an additional video capture card.

Note that if the external application runs on the Windows operating system, and it does not use 3D graphics acceleration or it does not have a high processor load and high memory usage, it may be more suitable and less complex to instead run this on the same computer as Tobii Studio and use the Screen Recording option in Tobii Studio.

For this setup, the image from the Tobii Studio computer has to be displayed on the screen during calibration (to display the calibration points). The external stimulus computer, however, should be shown on the screen during the actual test. Both devices must therefore be connected to the same screen. To switch between the inputs, use a switch or a screen that allows for multiple input sources. The image shown on the screen must be sent to Tobii Studio to record the video stream and synchronize it with the gaze data. If the stimulus is presented from an analogue video source, e.g., a VCR or an analogue video camera, a similar setup with slightly modified components can be used.

External Video Stimulus Recording Setup



Appendix A: Glossary

Monocular/binocular	Monocular data shown is based on data from each eye individually. Binocular data is the average of the two eyes.
Gaze precision	Describes the spatial angular variation between a set of consecutive gaze samples. Gaze precision can be measured under various conditions. For more details, see *Appendix B: Accuracy and Precision Measurements*.
Gaze accuracy	Describes the angular average distance from the actual gaze point to the one measured by the eye tracker. Gaze accuracy can be measured under various conditions. For more details, see *Appendix B: Accuracy and Precision Measurements*.
Sampling rate	Number of eye tracking data samples per second.
Total system latency	The duration from mid-point of the eye image exposure, to when a sample is available via the API on the client computer. This includes half of the image exposure time, plus image read-out and transfer time, processing time and time to transfer the data sample to a client computer.
Time to tracking recovery for blinks	When a subject blinks, the eye tracker loses the ability to track eye gaze because the eye is covered by the eye lid. If the pupil is occluded for only a short period, the system will regain tracking immediately when the pupil becomes visible again, but only if the subject has maintained approximately the same head position during the blink. Data during blinks are only lost when the pupil is occluded, i.e. during the eye lid movement itself or when the eye is closed.
Time to tracking recovery after lost tracking	An eye tracker working in a natural user environment may occasionally lose track of the subject's eyes, e.g., when the subject completely turns away from the tracker. If a period of a few hundred milliseconds elapses during which the eye tracker is unable to detect the eyes in close proximity to where they were last detected, the eye tracker will start searching for the eyes within the entire head movement box. The stated measurement is the typical time to tracking recovery in such a situation. If the eye tracker is unable to detect the eyes of the subject even after about one minute, the system will enter a "slow search" mode, leading to larger recovery times.
Freedom of head movement	Describes an area (width x height in cm) where at least one eye is within the eye tracker's field of view.
Operating distance	Describes the range of distances (minimum and maximum) between the subject's eyes and the surface covering the eye tracker sensors at which eye tracking can be done while maintaining tracking.
Eye tracking processing unit	Gaze data calculations are performed by firmware embedded in the eye tracker or in a separate processing unit.

Appendix B: Accuracy and Precision Measurements

Gaze accuracy and precision are typically measured in degrees of visual angle. One degree accuracy corresponds to an average error of 12 mm (0.47″) on a screen at a distance of 65 cm (27″). Data is presented as monocular or binocular. Monocular data is based on data from the subject's dominant eye presented as monocular or binocular. Monocular data is based on data from the subject's dominant eye only. Binocular data is the average of both eyes.

B:1 Gaze Precision

Precision measurements are done using artificial eyes to eliminate artifacts from human eye movements. Tobii specifies precision both with and without noise reduction filters. All measurements are done at the default sampling rate of the eye tracker and at the optimum distance between the eye tracker and the subject. Precision is calculated as root-mean-square (RMS) of successive samples.

As the distance from the eye tracker influences precision, measurements are also taken at various distances. Data from these measurements is binocular.

B:2 Gaze Accuracy

Accuracy under ideal conditions is measured in the center of the head movement box with the subject fixed in a chinrest. Data is collected immediately after calibration, in a controlled laboratory environment with constant illumination, with 9 stimuli points at gaze angles ≤18°. Measurements are done on 20 test subjects without lenses, glasses or droopy eyelids. Accuracy for one subject is calculated as the mean of several data samples for several stimuli points across a screen. The accuracy figure presented is the mean accuracy from all subjects.

Good accuracy is difficult to achieve at large gaze angles, but is important when testing large stimuli. For instance, the upper corner of a 23″ screen with the test subject at a distance of 65 cm (26″) from the eye tracker corresponds to a 32° visual angle from the center of the eye tracker unit. Consequently, measurements are also presented for stimuli presentations at large gaze angles.

When luminance of the stimuli or the illumination in the lab changes, the size and shape of the pupil is affected. Unless compensated for, this may cause a significantly reduced accuracy. Testing the influence of surrounding light and stimuli luminance on accuracy is done in a laboratory environment with controlled light conditions. Stimuli points are presented on a black background so as not to influence ambient light conditions. Testing is also done with ambient light at a level deemed 'normal' office lighting where the background is changed to white with black stimuli points. The results from a test in which the background was changed has been referred to as Drift in previous Tobii product description documents.

As with precision, the distance from the eye tracker influences accuracy. When testing this influence, calibration is done with the subject in the center of the head movement box (i.e. at a distance of 65 cm) and measurements are done thereafter. Measurements are performed with the test subject at precise and specific distances relative to the eye tracker, measured along the axis of the tracking sensors. Data from these measurements is binocular.

Appendix C: Compliance Information and Warnings

All Tobii X2 Eye Trackers are CE-marked, indicating compliance with the essential health and safety requirements set out in European Directives.

C:1 FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications not expressly approved by Tobii could void the user's authority to operate the equipment under FCC rules.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into a wall outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or experienced radio/TV technician for assistance.

C:2 Industry Canada Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

C:3 Standards

The Tobii X2 Eye Trackers complies with the following standards:

- IEC/EN62471, Photobiological Safety of Lamps and Lamp Systems
- EMC Emission: EN 61000-6-3:2001 including EN 55022:1998/A1/A2 Class B, FCC part 15, Class B
- EMC Immunity: EN 61000-6-1:2007
- FCC part 15, Class B

C:4 Mounting Warning

The Tobii X2 Eye Trackers should be mounted according to instructions for approved mounts . However, should the device for any reason harm or damage someone or something due to falling or other. Neither Tobii nor any of its representatives will be responsible or liable for any damages or injuries which may arise. The mounting of the Tobii X2 Eye Trackers is done entirely at the user's own risk.

The double sided tape supplied with the adhesive Magnetic Mounting Plates is designed to permanently attach the bracket to the monitor/laptop. Attempting to remove the bracket after attaching it using the supplied tape can result in damages both to the monitor/laptop and the bracket.

C:5 Infrared Warning

When activated, the Tobii X2 Eye Trackers emits pulsed infrared (IR) light. Certain medical devices are susceptible to disturbance by IR light and/or radiation. Do not use the Tobii X2 Eye Trackers when in the vicinity of such susceptible medical devices as their accuracy or proper functionality could be inhibited.

Tobii Support

EUROPE/ GLOBAL	NORTH AMERICA	JAPAN	CHINA
Phone (SWE): +46 8 522 950 10	Phone: +1 703 738 1320	Phone: +81 3 5793 3316	Phone: +86 180 1558 5168
Phone (GER): +49 69 24 75 03 4-27 support@tobii.com Support hours: 8 am - 6 pm	support.us@tobii.com Support hours: 8 am - 8 pm	support.jp@tobii.com Support hours: 9 am - 5.30 pm	support.cn@tobii.com
Between July-August: 9am - 5pm	(US Eastern Standard Time, GMT -6)	(Japan Standard Time, GMT +9)	
(Central European Time, GMT +1)			

©Tobii®. Illustrations and specifications do not necessarily apply to products and services offered in each local market. Technical specifications are subject to change without prior notice. All other trademarks are the property of their respective owners.

Tobii Headquarters (EMEA)
Tobii Technology AB
Karlsrovägen 2D S-182 53 Danderyd
Sweden

Phone : +46 8 663 69 90
Fax: +46 8 30 14 00

www.tobii.com
sales@tobii.com

CENTRAL EUROPE
Tobii Technology GmbH
Niedenau 45 D-60325 Frankfurt am Main
Germany

Phone: +49 69 24 75 03 40
Fax: +49 69 24 75 03 429

www.tobii.com
sales.de@tobii.com

CHINA
Tobii China - Sales Office
Room E2, 29/F
Shanghai Industrial Investment Building
No. 18 Caoxi North Road
Shanghai, China
Mobile: +86 180 1558 6966

www.tobii.com
sales.cn@tobii.com

JAPAN
Tobii Technology Japan, Ltd
3-4-13 Takanawa, Minato-ku
Tokyo 108-0074
Japan

Phone: +81-3-5793-3316
Fax: +81-3-5793-3317

www.tobii.com
sales.jp@tobii.com

NORTH AMERICA
Tobii Technology, Inc.
510 N, Washington Street, Suite 200
Fall Church
VA 22046
USA
Toll-Free: +1-888-898-6244
Phone: +1-703-738-1300
Fax: +1-703-738-1313
www.tobii.com
sales.us@tobii.com